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AUTHOR	Chang, Carrie
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ABSTRACT

This paper reviews literature in the past 60 years about the relationship between music experience and language reading. Results of the literature review fall into three categories: the first group of studies (group I) indicates that music experience benefits language reading due to six transfers of learning--prediction skill, whole-to-part strategy, awareness of rhythm, rhyme and phonological awareness, learning between two similar symbol systems, and eye span and movement. The second group of studies (group II) suggests music experience neither benefits nor undermines language reading. The third group of studies (group III) demonstrates that the learners' socioeconomic status, intelligence, or social capital are better indicators of language reading experience than music experience. It concludes that music experience does not hamper language reading, but whether music experience facilitates language reading and the extent to which music experience aids language reading remains nebulous. (Contains 51 references, a table, and a figure illustrating the relationship between aspects of music and aspects of reading.) (Author/RS)

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Relationship Between Music Learning and Language Reading? Review of Literature.

by Carrie Chang

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Carrie Chang

Relationship between music learning and language reading?

Review of literature

Abstract

In this paper, the author reviews literature in the past sixty years about the relationship between music experience and language reading. Results of the literature review fall into three categories—The first group of studies (group I) indicates that music experience benefits language reading due to the following six transfers of learning: prediction skill, whole-to-part strategy, awareness of rhythm, rhyme and phonological awareness, learning between two similar symbol systems, and eye span and movement. The second group of studies (group II) suggests music experience neither benefits nor undermines language reading. The third group of studies (group III) demonstrates that the learners' socioeconomic status, intelligence, or social capital are better indicators of language reading achievement than music experience. The conclusion is that music experience does not hamper language reading, but whether music experience facilitates language reading and if so, how and the extent to which music experience aids language reading remains nebulous.

Introduction

Generally speaking, there are three types of theories on the process of reading: Letter and word recognition theory, comprehension theory, and balanced theory (Purcell-Gates, 1997). As its name suggests, letter and word recognition theory highlights the importance of being able to recognize letters and words. Gough (cited in Purcell-Gates, 1997) claimed that reading process is linear in that readers recognize letters, transfer them to sounds and then move on to the next letter. He believed readers undergo the same process when recognizing words. Unlike Gough, LaBerge and Samuels (cited in Purcell-Gates, 1997) focused on "automaticity" in word recognition, meaning that after readers master the skills in letter and word recognition, they no longer consciously but automatically attend to letters and words. Thus, they recommend that readers practice and master decoding skills before the process of comprehension. Adams furthermore

suggests that readers not only recognize words letter by letter but also translate these letters into sound units to be pronounced and understood (Purcell-Gates, 1997).

Unlike letter and word recognition theory that holds a bottom-up point of view, comprehension theory emphasizes a top-down point of view in reading process. It suggests that readers, in light of their experiences and background knowledge, try to confirm or disconfirm their predictions and expectations with the aid of linguistic cues as they read. As a result, reading process is cyclical rather than linear in a sense that semantic, syntactic, pragmatic, visual, or perceptual cycles are constantly involved. Hence, readers should participate in authentic writing and reading in order to generalize the underlying rules from the input.

Balanced theory, on the other hand, espouses both letter and word recognition theory and comprehension theory because it believes that readers focus on letter, word features and comprehension and simultaneously predict from linguistic cues given in the context. In addition, social and cultural factors are thought to play roles in writing and reading processes.

Some researchers have proposed that music education not only works for music per se but also has values added to language reading on the grounds that music reading is similar to language reading, thus skills acquired via music training may be transferable or generalizable to language reading. However, whether this hypothesis is true or not remains unclear. Even if it is true, what exactly is transferred or generalized from music reading to language reading is still under debate because after all, little is known about the connection of music and language reading. Consequently, the purpose of this paper is to examine the similarities and relationship between music reading and language reading by reviewing literature and research in the past six decades.

Method

After consulting with Professors Larry Mikulecky in Language Education, Donald Cunningham in Educational Psychology, and Robert Hatten in Music Department at Indiana University, Bloomington about how to study the relationship between music and language reading, the researcher decided to do a general overview of research associated with music and language reading. The researcher located literature by using the keyword "music and language" in the database of IUCAT (Indiana University Catalog), LLBA

(Linguistic and Language Behavior Abstract), ERIC, Dissertation Abstract, Academic Search Elite, and Ebsco Online Citations via the Indiana University library system. The researcher also checked bibliographies of journal articles, books, dissertation, and microfilms as well as the Internet.

Review of Literature

Research investigating the relationship between music and language reading is divided into three groups: The first group (group I) suggests that music experience does benefit language reading in some ways. The second group (group II) finds that even though music experience does not benefit language reading, it does not hinder language reading either. The third group (group III) claims that variables other than music experience are related to language reading abilities. Results will be reported in the order of group I, II, and III in the following paragraphs (see table 1 below)—

Table 1: Language ability in relation to music experience and other variables

	+Music experience	**-Music experience**
+Other	**N/A**	**Group III:** **1)Socioeconomic status** **2)Social capital** **3)Intelligence**
-Other	**Group I:** **1)Power of prediction** **2)Whole-to-part strategy** **3)Awareness of rhythm** **4)Rhyme and phonological awareness** **5)Transfer of learning between similar symbol systems** **6)Eye span and movement**	**Group II**

(+ means a relationship; - denotes no relationship)

Group I—Some research has explicitly shown that a relationship between music and language reading does exist while other research only implies the relationship. Power of prediction, whole-to-part strategy, awareness of rhythm and rhyme, transfer of

learning between similar symbol systems, and development of larger eye span and rapid movement are six skills transferable from music learning to language reading.

1)Power of Prediction:

To examine whether music reading is similar to language reading in that both require the strategy of predicting possible continuations, eighteen elementary school string students participated in Hahn's (1987) study. After two months of prereading lessons, the control group was given instruction emphasizing recognition of pitch and note values in isolation while the experimental group was trained on perception of melodic contour and rhythmic units. After the control and experimental groups finished the recognition task (identify four different melodies that they had played in prereading lessons) and the sight-reading task (play an unfamiliar musical notation), scores were compared with pretest scores. Result showed that there was no difference concerning the recognition task between the two groups, but the experimental group surpassed the control group in sight-reading, which suggests that music reading skill could be facilitated by instruction that focuses on whole-to-part strategies. Hahn thus concluded that like language readers who sample semantic units and then predict continuations, music readers also use the strategy of perceiving melody contours and rhythm patterns in order to predict continuations.

However, it seems that Hahn did not control such variables as socioeconomic status, sex (control group consisted of all girls while experimental group was made up of six boys and three girls), and private music instruction, which weakens the author's conclusions. Moreover, it is the researcher's speculation that the sample of this study is too small (N=18) to possess any statistical significance. Additionally, since professional musical training encompasses both treatments given to the control and experimental groups, which kinds of musical training (pitch, and note values vs. melody, and rhythm) are most beneficial to language reading is still cloudy and need further investigation.

Unlike Hahn's study, the experiment by Halpern and Bower (1982) cited in Sloboda's (1985) book also showed that musicians performed better in "good melodies" that followed normal rules of harmonic and melodic progression than in "bad melodies" that violated musical conventions. Non-musicians, however, showed no difference

between the two types. Again, this author believes that music-specific knowledge and expectation were responsible for the difference between musicians and non-musicians.

Aiello (1994) based on literature he reviewed, proposed some similarities between music and languages: (1) Acquisition process—When learning language and music, children abstract rules and then utilize them to create their own sentences and music, respectively. (2) Cognitive characteristics—Music and language both evolve over time and involve meaningful uses of sound patterns. (3) Components—Music and language both are comprised of meter, rhythm, pitch, and tone.

Concerning phonology, music and language have at least two features in common: (1) Categorical perception: Musical notes can be compared to phonemes of a language. Just like native speakers can categorize speech sounds that are phonemic in their language more accurately the non-native speakers, musicians can categorize musical sounds better than nonmusicians. (2) Phonemic restoration: When processing music or language, listeners use their previous knowledge to supply what is missing. A study conducted by De Witt and Samuel (1990) indicated that like listeners of languages would supply the missing information when a phoneme within a word is replaced by noise, listeners could not indicate whether a noise replaced or coincided with a musical pitch in familiar melodies owing to the interference of their expectation.

Syntax—Aiello postulated that people perceive structures in music and language in similar ways. (1) Reading experiments: Studies conducted by Sloboda (1985), and Levin and Kaplan (1970) have shown that like experienced readers who take in material to a phrase boundary during the process of language reading, experienced music readers also identify structural units and scan accordingly. (2) Phrase boundary experiments: Listeners tend to segment music and language according to the structure. Regardless of musical training experiences, listeners had more difficulty perceiving two-note probes straddling the phrase boundary than those occurring at the beginning of the phrase or at the end of the first phrase, according to a study done by Tan, Aiello, and Bever (1985). In the same way, Aiello suggested that familiarity with the syntax of language may influence the perceptual organization of clauses or sentences. (3) Click experiment: In two studies done by Fodor and Bever (1965), and Gregory (1978), listeners tended to

perceive the click falling at the end of the phrase where the phrase boundary falls during the experiments in which they heard some verbal or musical materials.

2)Whole-to-Part Strategy:

Sloboda (1976) tested whether readers make inferences about interior letters in words in normal prose reading situations in the following two experiments. In the first experiment, twenty-one university students were asked to mark misspelt words while reading aloud a narrative passage at normal speed. These "misspelt" words containing either six or seven letters were altered in one of the three ways: The first two, the middle two, or the last two letters were transposed. Results showed that each alteration was different from other alterations ($p<0.001$ in all cases) and middle transposition was least detected while beginning transposition most well detected ($p<0.025$ for six-letter words and $p<0.001$ for seven-letter words). Sloboda thus suspected that subjects inferred the presence of a word without analyzing the interior letters. One hypothesis supporting this claim, according to Sloboda, is that interior letters are the most redundant parts of the words, thus redundancy makes it difficult for readers to analyze them. The second experiment examined whether inference was positionally distributed within the phrase in music reading tasks. Seven adult musicians were asked to sight-read and play four two-staved extracts which contained some notational errors, some of which appeared at the first two beats of a phrase, some at the end of a phrase, and the others appeared at other positions. Results indicated that unaltered notes played inaccurately was only 2% as opposed to the 40% of error rate on altered notes. Also, subjects nearly always played what the notes should have been. As far as upper stave is concerned, middle alterations were least detected (38%) and beginning alterations were best detected (75%). In the case of lower stave, end alterations were best detected (69%) and no significant difference was found between the beginning and middle alterations (58% and 57%). Sloboda postulated that sight readers used structural constraints to infer in the middle of phrases. Results of this study were also consistent with the hypothesis that readers attended most to low redundancy near phrase boundaries and may not attend so closely to great redundancy in the middle of phrases.

According to Sloboda, little is known concerning whether similarity of position effects in prose and music reading resulted from similar structure in both forms or similar

strategies that happened to work well in both domains. Nevertheless, he claimed that some evidence has shown that words are stored in memory on the basis of their initial and final elements and this implication for reading may be generalizable to music. One thing researchers need to explore more is whether inexperienced language and music readers also use a strategy of prediction to facilitate reading.

Other experiments conducted by Sloboda (1974) yielded the same results. In experiment four of his dissertation, four musicians and four non-musicians were asked to recall the three notes they saw in each of the thirty-six stimulus cards. Six durations, 20, 40, 60, 80, 100, and 150 msec, were played in either ascending or descending fashion. Regarding accuracy, subjects performed better at long duration ($p<0.001$). Musicians were only better than non-musicians in 150 msec duration ($p<0.025$). Subjects reported that they did not locate individual note, but rather identified the contour, that is, seeing a note as relatively higher or lower than the preceding one. In other words, subjects attempted to locate the first note and then fix the contour on the stave. Like the experiments Sloboda conducted (1976 and 1978 cited in Sloboda, 1985), results of Massaro and Klitzkes' (1977 cited in Sloboda, 1985) and Navon's (1977 cited in Sloboda, 1985), studies also indicated that musicians took greater advantage of contour in storing the positions of notes. In addition to contour, musicians stored information about scale and arpeggio-like patterns in particular, probably because such patterns are usually associated with routine finger and hand movements. As a result, Sloboda suggested that rapid identification of routine patterns allowed performers to advance motor planning. Most importantly, these superior strategies of coding and storing notes helped the retention and performance of stimulus.

Experiment five of Sloboda's (1974) dissertation was to test whether readers pay more attention to the outsides of words instead of the inside. A passage containing thirty-six six-letter misspelt words, twelve of which the first two letters were altered, twelve the middle two letters were altered, and twelve the last two letter were altered, was given to forty-two subjects (twenty-one university students and twenty-one sixth-graders). Subjects were asked to read out the passage and simultaneously circle the misspelt words. They were also asked to summarize the passage right after they finished reading. Results of this study showed that both children and adults detected misspelt words best when the

altered part was at the beginning. Words whose interior parts were altered were least detected. The difference was significant for both groups ($p<0.001$ in both cases). Also, each type of alternation was significantly different from other two ($p<0.001$ in all cases except middle vs. end for children, $p<0.05$). Sloboda's conclusion was that interior spelling errors were less likely to be detected because readers used beginning and end letters to identify words.

In experiment six of Sloboda's (1974) dissertation, twenty-two six-year-olds who could name letters but had limited reading experience and thirty-six ten-year-olds served as subjects. They were given a booklet in which gapped words (words altered by transposing adjacent letters, e.g. aprtner, pratner, patrner as alternations for partner), ungapped words (words running together without gaps, e.g. partnerpartnerpartner), gapped non-words (psudowords altered by transposing adjacent letters), and ungapped non-words(psudowords running together without gaps) were listed and they were asked to underline misspelt words. Results were that beginning alternations, whether gapped or ungapped, were the best detected compared to middle and end alternations ($p<0.01$ and $p<0.001$, respectively), and no significant difference was found between middle and end alternations. For non-words, however, no difference was found (p value not reported) either in gapped or ungapped condition. In other words, subjects attended equally to all portions of a non-words. Besides, subjects were faster in reading words and gapped material.

Errors in reading were again investigated in Sloboda's (1985) book, *The musical mind: The cognitive psychology of music.* Pillsbury (1897 cited in Sloboda) demonstrated in a study that experienced language readers tended to unconsciously transform misspelt words into the correct forms, which Sloboda believed is because readers can identify words based on less than complete information, given their knowledge of the spelling of words. When it comes to reading text, Sloboda supposed the effect of prediction is even stronger on the grounds that context provides additional information. So, it is under the circumstances in which the unexpected occurs that readers may fail to make inferences. Misprints are more likely to be detected when they occur at the beginning of words than the middle or end of words (Haber & Schindler, 1981; Sloboda, 1976 cited in Sloboda, 1985). Also, spelling errors are less likely to be

recognized when they are visually similar to the correct forms (Healy, 1980 cited in Sloboda, 1985). Similarly, experienced music readers make more inferential prediction than poor ones, according to Sloboda. For example, the study done by Wolf (1970) indicated that poor readers were the first to detect misprinted errors because they did not have expectations to intervene with their reading.

In a nutshell, all of Sloboda's experiments led to the conclusion that both music and language readers do not have to get the complete information from what they read in order to achieve comprehension.

Unlike Sloboda, Baumgarte and Franklin (1981) approached the issue of music experience and language reading from the perspective of brain research. Their study (1981) with twenty-five musicians and twenty-five nonmusicians explored the differences in lateralization between musicians and nonmusicians for tonal, rhythmic, melodic, and verbal stimuli in an attempt to further clarify the effects of music training on music perception. Participants listened to tests of four different dichotic tasks. Each test encompassed twenty-four trails and was played to the participants twice. In each trail a dichotic presentation of two fragments was presented to the participants, and then four fragments presented in sequence binaurally. Participants' task was to identify the two dichotic fragments from among the four choices and indicate their serial positions in the sequence.

Results of Baumgarte and Franklin's study demonstrated that musicians performed better than nonmusicians in all three musical tasks ($p<0.001$ in melodies and tonal patterns and $p<0.025$ in rhythm patters), and no difference was found between musicians and nonmusicians concerning the verbal task ($p>0.05$). Although both musicians and nonmusicians showed progress on the verbal tasks ($p<0.025$, and $p<0.01$, respectively), only the musicians showed a significant overall increase on the musical tasks ($p<0.01$). Also, musicians tended to have left ear superiority for the melodies, rhythm tasks and a right ear superiority on the verbal task ($p<0.05$ in all cases) whereas nonmusicians revealed a left ear superiority for the melodies and tonal pattern tasks and a right ear superiority for the rhythm ad verbal tasks, but the difference was insignificant ($p>0.05$). In addition, musicians showed a significantly larger number of double corrects

(both right and left ears) on the three music tasks ($p<0.001$), but not on verbal tasks ($p>0.05$).

On the grounds that left ear superiority indicated right brain domination while right ear superiority suggested left brain domination, Baumgarte and Franklin concluded that musicians displayed greater flexibility in strategies for processing melodic, tonal, and rhythmic stimuli and may adopt either a holistic or analytical approach tailoring to the type of task presented. Also, music training resulted in effects on the processing of music stimuli. In other words, Baumgarte and Franklin believed that musicians were able to use the processing abilities of both hemispheres more efficiently and to a greater degree than nonmusicians. Finally, the hemisphere that is more active for a specific task seemed to depend upon the kind of processing strategy demanded by the task instead of the properties of the stimulus itself.

To thoroughly understand what kinds of musical training was transferable or applicable to language reading, the researchers should have examined what kinds of training those musicians had.

3)Awareness of Rhythm:

A total of seventy-eight fourth-graders participated in Douglas and Willatts' (1994) study that investigated the relationship between musical ability and literacy skills. Participants were given three tests: (1) The British Picture Vocabulary Scale was used to test verbal ability. (2) Aural awareness test encompassed two parts: In the first part, participants listened to ten pairs of pitch sounds sung by a female and then were asked to identify whether the second sound as higher, lower, or the same as the first one. Similarly, participants were asked to identify if the second rhythmic pattern was the same as or different from the first one. (3) The Schonell reading and spelling tests were given to measure ability of word recognition and spelling, respectively. Results of these tests indicated that verbal ability and pitch awareness were both related to other measures, but the relationship was stronger for the former (all $p<0.002$) than the later ($p<0.002$, $p<0.02$, and $p<0.02$). Also, significant correlations were shown between rhythm and reading and spelling ($p<0.002$, $r=0.409$, and $r=0.347$) as well as between reading and spelling ($p<0.002$, $r=0.926$). Douglas and Willatts suggested that children with higher IQ may have outperformed others on reading and aural awareness since verbal ability was also

correlated with other measures. So, they compared the results of reading, spelling with aural awareness with the variable of vocabulary ruled out and found that while rhythm remained related to reading and spelling ($p<0.02$ and $p<0.05$, respectively), pitch no longer showed a significant relationship to reading and spelling. Douglas and Willatts therefore summed up that rhythm was more related to reading ability ($p<0.02$, $r=0.306$) than to spelling ($p<0.05$, $r=0.245$).

To further test whether musical training benefits children with reading difficulties, Douglas and Willatts conducted a follow-up pilot intervention study of twelve eight to ten years old children who had reading difficulties. Before children were divided into control and intervention groups, they took the Schonell test that ensured the two groups were matched for reading ability. During the six-month long study, the intervention group received musical training that was designed to develop children's auditory (rhythm and pitch), visual and motor skills whereas the control group participated in non-musical activities that were to develop all aspects of discussion skills. After six months, reading ability of these children was again assessed. Comparing the initial and final tests on reading, Douglas and Willatts found that the mean scores of the intervention group increased while those of the control group did not. They thus suggested that music skills contributed to improvement in reading ability.

Again, researchers need to be cautious if musicians are more sensitive to rhythm, and also whether this sensitivity derives directly from their musical training.

4)Rhyme and Phonological Awareness:

To explore whether experience with rhyme in preschool benefits children's reading skills, four-to-five year old children who could not read participated in Bradley and Bryant's (1983) study. Children were asked to detect odd words to show their skill of sound categorization. Three years later, children were given standardized tests (Wechesler Intelligence Scale for Children/R, and MATB-NFER) on reading and spelling as well as IQ. Result showed that there was a high relationship between sound categorization scores and reading and spelling scores ($p<0.001$). Simultaneously, in the second year of the project, sixty-five children with lower sound categorization scores were selected from the sample and divided into four groups: Group one received sound categorization training, group two received sound categorization training and how

common a sound was represented by a letter of the alphabet, group three conceptual categorization training (e.g. hens and bats are animals; hens and pigs are farm animals) while group four received no training. After two years, group two outperformed group one that surpassed group three on reading and spelling, which makes Bradley and Bryant believe that training in sound categorization is more effective when it also involves explicit connection with alphabets. They thus concluded that the relationship between phonological (rhyme and alliteration) awareness and reading and spelling abilities is a casual one.

However, the bridge between music training and phonological awareness is yet to be built owing to the fact that no research has shown that musicians are more aware of phonological differences.

In addition to Bradley and Bryant's report, McClean (1987) also examined the relationship between phonological awareness and language reading. Sixty-six children starting at the age of three participated in McClean's fifteen-month long project that investigated the relationship between knowledge of nursery rhyme and phonological awareness. McClean also intended to find out whether the parents' social class and educational level influenced their children's knowledge of nursery rhyme, phonological awareness and whether nursery rhyme and phonological awareness were related to reading and arithmetic abilities of these children at the end of the project when they were between four and five years old. Children took two standardized tests: The British Picture Vocabulary Scale and the Wechsler Preschool and Primary Scale of Intelligence. Results showed that (1) Nearly all children knew something of the nursery rhymes and had certain phonological awareness at the age of three. (2) Children whose parents had college level education performed better than the rest in the alliteration detection task ($p=0.026$). However, no significant difference was found in other tasks. (3) Knowledge of nursery rhymes was strongly related to phonological skills ($p<0.001$) even when other variables, such as IQ and parents' social or educational level were controlled. (4) No connection was found between knowledge of nursery rhymes and arithmetical skills. (5) Early rhyme and alliteration scores were related to reading words but not recognition of alphabets.

Nicholson (1972) conducted research to see if music can improve certain reading abilities of slow learners. Fifty elementary school students between the age of six and eight, matching up for IQ, sex, age, reading achievement, socioeconomic status, and class, were assigned to either the control group that focused on listening to and singing songs, and playing instruments or the experimental group that focused on 1) melody and rhythm: clapping hands or using body movements to develop muscular discipline 2) using various instruments to present different concepts, such as highness in triangle and lowness in bass drum 3) alphabets A~G were taped on each bar of the xylophone, so letters could be connected to musical pitch 4) children followed each dot from left to right with their right forefinger in order to be aware of reading from left to right. Results on the pretest, the Metropolitan Reading Test, and posttest, the Botel Test of Reading Achievement showed that music can improve the ability of slow learners in the recognition of letters of the alphabet and reading readiness skills ($p<0.001$). In addition, the experimental group spent more time on musical instruction ($p<0.05$), and outperformed the control group in recognition of concepts, letters, or musical symbols ($p<0.001$ in all cases). Nicholson's conclusions are 1) melody, rhythm, and meter in music increased students' attention span 2) the experimental group performed better in the recognition of letters because they were taught to discriminate and match pitch by singing, which facilitated retention of the material. Also, sounds exaggerated by singing emphasize particular characteristic sound of each alphabet, which in turn helped children to remember the sound, according to Nicholson. Children were also encouraged to sing rhymes about the letters, which again increased the ability to remember materials presented. 3) the experimental group was taught the recognition of musical phrase and using music to accompany physical activity, so it performed better in the recognition of musical phrase. Also, the experimental group outperformed the control group in differentiating alphabet letters, including S vs. Z, A vs. H, M vs. N, B vs. D, T vs. I, E vs. F, O vs. Q or U, V vs. W, and P vs. R($p<0.001$ in all cases).

Mean scores in the MRT and the BTRA are significant for the posttest results. Children in the control group did not improve, but those in the experimental group improved from "poor risk" to "average". Hence, Nicholson recommended that study should be replicated, selecting subjects randomly and addressing broader learning

problems, examining older learners, and conducting longer studies to measure how music can aid writing skills.

5)Transfer of Learning between Similar Symbol Systems:

Hurwitz (1975) conducted two studies examining the effects of the Kodaly method that centers on musical games, clapping, reading musical notes, rhythmic notation, and singing. Of the first graders participating in the first study that investigated the effect of Kodaly method on sequencing and spatial skills, twenty (ten girls and ten boys) from a middle class suburban school where Kodaly instruction had been practiced for seven months, five days a week, forty minutes per session when the comparison was made served as the experimental group. The other twenty students who matched up with the experimental group in socioeconomic background, school size, academic standards, age, IQ, and ordinal position in the family served as the control group. Both the experimental and control groups took the sensorimotor sequencing and verbal perceptual sequencing tests. In the former test, students were asked to tap two mechanical keys, changing the left and right hands and maintaining steady rhythm. In the latter test, students learned some simple repetitive acts, including naming of repeated objects by identifying three familiar flashcards and three cards of the Stroop Color-word-interference Test. In addition, by administering such tests as the Beery-Buktenica Visual Motor Integration Test, the Children's Embedded Figures Test, the Raven Standard Progressive Matrices, the Graham Kendall Memory-for-Designs, the Block Design and Object Assembly subtests of the Wechsler Intelligence Scale for Children (WISC), Comprehension and Vocabulary subtests of the WISC, students' perceptual restructuring and verbal intelligence abilities were assessed. Results are (1) The experimental group outperformed the control group in three of the five sensorimotor tapping tasks ($p<0.05$). 2) Boys in the experimental group were better than those in the control group on two of the three verbal sequencing tasks ($p<0.01$, $p<0.01$, and $p<0.05$), on two of the three verbal sequencing tasks ($p<0.05$, and $p<0.05$), and on three of the four spatial tasks including the Block Design subtest of the WISC ($p<0.05$, $p<0.05$, and $p<0.001$). (3) Girls in the experimental group, however, did not perform better on any of the items than girls in the control group.

In Hurwitz's second study that examined the effects of the Kodaly method on academic achievement, school records of first-graders receiving one year Kodaly instruction were compared with those without the Kodaly instruction. Also, the Metropolitan Readiness Test (MRT) administered at the beginning of first grade year showed no difference between children with and without the Kodaly instruction, but a significant difference was found on the reading scores of the MRT at the end of the first grade year, favoring the Kodaly group. Other findings include: (1) At the beginning of the year boys in the non-Kodaly class scored higher on overall readiness measure than boys in the experimental group ($p<0.05$) whereas girls did not differ in readiness measures. (2) However, at the end of the year, boys in the experimental and control groups did not differ in reading achievement, which suggested that the experimental group had benefited from the Kodaly method. On the other hand, girls in the experimental group scored higher on overall reading than girls in the control group ($p<0.05$). (3) When teaching style was taken into account, it is found that Kodaly instruction children taught by the same teacher who taught the non-Kodaly class scored higher than the non-Kodaly class ($p<0.01$). (4) At the end of the second grade year, the Kodaly class was again compared with the non-Kodaly class and result showed that the former group outperformed the latter group in the reading section of the Metropolitan Achievement Test Primary II ($p<0.01$). Even though results of this study showed that Kodaly students turned out to be better language readers, the specific effect of transfer remained obscure. Although this study did not explicitly pinpoint the benefit of music reading on language reading, it is this author's speculation that since music and language both embody symbols in their systems, the effect of practice and familiarity with reading musical notes and rhythmic notation could be carried on to language reading.

Owing to the fact that the Kodaly method emphasizes more than one skill (reading notes, rhythmic notation, singing, etc), which type of Kodaly training benefits language reading most requires more investigation.

Movsesian (1967), on the other hand, was interested in the relationship between teaching specific music reading skills and learning basic reading skills in primary grades. One hundred and thirty-five students from two first-grades, two second-grades, and two third-grades of two school districts participated in study. One of the classes in each grade

served as the control group which received musical training focusing on singing, listening to records, and rhythms and the other class served as the experimental group that also received the same training but with an emphasis on specific music reading skills. Students were also selected so that there were equal number of sexes in each group and they were all from middle to lower socioeconomic levels. In addition, the Reading section of the California Achievement Test was administered to check subjects' reading skill, and the Survey of Primary Music Reading Development that has six sub-tests was also used.

At the beginning and the end of the year, the Gray Oral Reading Test (GORT), the California Achievement Test (CAT), and the Survey of Primary Music Reading Development (SPMRD) were conducted to compare the scores on the pretests and posttests, except the California Short-Form Test of Mental Maturity (CSFTMM) which was only administered for the pretest. Results showed that (1) For the first and second graders, the experimental group made more progress in the CAT and the SPMRD than the control group ($p<0.01$, and $p<0.01$ for first graders while $p<0.001$, and $p<0.001$ for the second graders). However, the experimental group did not make significant progress compared to the control group in GORT ($p>0.05$ in both first and second grades). Movsesian suspected that subjects might not be mature enough to absorb the full effect of their learning when applied to oral reading. (2) As far as third graders are concerned, the experimental group outperformed the control group in the GORT and the SPMRD ($p<0.001$ and $p<0.01$, respectively), but it was not found in the CAT ($p>0.05$). Therefore, Movsesian again speculated that reading habits that had been acquired during grades two and three might make it difficult for subjects to utilize the effects of music reading method or subjects were simply not as impressionable as the first and second grades in this study. (3) When the performance of the experimental and control groups in the subtests of the CAT were compared, results are the following:

California Achievement Test	*First grade*	*Second grade*	*Third grade*
Reading vocabulary	$p>0.05$	$p<0.01$	$p>0.05$
Reading comprehension	$p<0.001$	$p<0.01$	$p>0.05$

Conclusions drawn from this study are: (1) Unlike first and second graders of the experimental group who became more efficient in utilizing basic reading skills, third

graders improved their efficiency in oral reading. (2) While the reading comprehension skill of first graders of the experimental group was improved, reading vocabulary skill was not. (3) In contrast to second graders of the experimental group who sharpened reading vocabulary and reading comprehension skills, third graders did not. (4) Generally speaking, first and second graders benefited more in absorbing the values of music reading skills than third graders.

Further research is needed to examine how long it takes to make music's effects on language reading most salient, distinctive, and detectable.

6)Eye Span & Movement:

Harris (1947) proposed that music reading might facilitate language reading in four aspects: auditory perception, visual perception, eye-span and phrasing, and reflecting reading defects. She believed there was a connection between the ability of hearing sounds in reading and that of matching a pitch in music on the grounds that the majority of her students who had difficulty with auditory perception in reading also tended to have trouble with rhythm and pitch in music. Thus, to help those people establish good listening habits was crucial, according to Harris. In addition to auditory perception, visual perception is essential in music and language reading as well. Just like music readers discriminate technical symbols, different types of notes, and their position on the stave, language readers also use reasoning skill to analyze words and phonics. Harris also stated that eye-span and phrasing ability is a prerequisite for fluent music and language reading. Poor music readers tended to read note by note just as poor language readers read word by word. Music can be used to check certain reading defects, particularly auditory perception, Harris claimed. For instance, if a child can recognize musical sounds but fails to recognize sound associated with reading, it might indicate s/he has good auditory perception but needs special help in reading. On the other hand, if the child has difficulty in both music and language reading, that could mean s/he needs ear-training. Once good listening habits are developed, children benefit music and language reading simultaneously.

Sloboda (1985) also agreed that sight reading is a skill required in both language and music reading and in order to advance sight reading, some strategies are needed—

fluent readers look further ahead than poor ones, and better readers detect structures or patterns as they read.

Eye movement: The reading of language and music both demand the eyes to move from left to right over a page to expose the material to central vision. O'Regan's (1979 cited in Sloboda, 1985) study of language reading suggested that the time readers spent fixating "the" is shorter than average, implying that linguistic knowledge interacted with incoming information to determine time of fixation. Weaver's study (Van Nuys & Weaver, 1943; Weaver,1943 cited in Sloboda,1985), on the other hand, showed that the nature of music determined the fixation in music reading. The strategy of vertical sweep down, a shift up to the right and then another sweep down was found in reading homophonic and chordal music while "fixation sequences which were grouped in horizontal sweeps along a single line, with a return to another line afterwards" in contrapuntal music that encompasses melodic fragments (Sloboda, 1985: 70). In other words, preview of structure facilitated rapid and fluent reading. Shaffer's (1976 cited in Sloboda, 1985) study of experienced copy-typists also confirmed this statement. When shown with at least eight characters ahead, typists' performance was the same as unlimited preview, ten characters per second. But when preview of characters dropped to one letter, their performance also decreased to two characters per second. Shaffer also randomized word order and letter order within words and found that the former had no impact on typists' performance but the latter caused their speed to decline to two characters per second. Shaffer thus came to the conclusion that preview allows typists to plan and coordinate hand and finger movements. Also, eye-voice span in language reading as well as in music reading has been investigated. After the text was unexpectedly removed, experienced readers could still continue reading out four to six words (Levin & Kaplan, 1970 cited in Sloboda, 1985). Similar study in music reading conducted by Sloboda also pointed out that fluent readers could still read out up to seven more notes after the notation was removed. Eye–hand span in music reading, however, does not yield consistent results, though eye span tended to coincide with phrase boundary of musical notation. Boundary beyond average span 'stretches' the span whereas that before average 'contracts' the span (Sloboda, 1985: 72). Also, because readers' eye span decreased when the melody lacked harmonic progressions or the

rhythm was obscured, Sloboda claimed that readers divided a phrase into performance unit by the harmonic and rhythmic structure of the phrase. Additionally, poor readers have lower span and less capable of isolating structurally defined units, compared to good readers. Sloboda also speculated that music readers might recognize certain frequently occurring pitch (e.g. arpeggio) and rhythm (e.g. dactylic) patterns as units. Even when the pattern is novel, they can still rely on the strategy of grouping notes, such as grouping by meter that can be used to hold a lot of note sequences. So, experienced readers do not need to fix a long time on frequently occurring pitch and rhythm patterns.

Sloboda (1974) conducted some other experiments at the University of London to see the similarities between music reading and prose reading. Experiment one was to estimate short-term memory for notes in four musicians and four non-musicians who were asked to recall (write down) what they saw in ninety-six cards with one-six notes on a stave. Concerning accuracy, musicians were better than non-musicians at recall ($p<0.001$), and outperformed non-musicians at two seconds for array length of four or more notes ($p<0.001$). As for short-term memory capacity, given two seconds, musicians could recall five notes but nonmusicians could only store four. When stimulus contained six notes, non-musicians declined to less than one note correct, which suggested that the attempt to remember notes more than four not only failed but also interfered with other notes already encoded. Regarding serial position, non-musicians displayed a decline in report accuracy from left to right and accuracy at any position with the increase in total number of notes. It suggests, according to Sloboda, that non-musicians were not coding effectively and the memory of early items was affected by the attempt to remember later notes. Sloboda suspected that because non-musicians always fixated to the left of the array, the accuracy of detecting the rightmost notes deteriorated whereas that of the first note remained the same as the array got longer. As far as error type is concerned, both music and non-musicians recalled better in two-second condition than 20 msec and their errors were only at one note distance, which Sloboda believed is because given the time constraint, subjects could not acquire enough information about the exact position of notes. He also speculated that the involvement of visual and non-visual coding—visual coding can store four items in less than 100 msec, but non-visual coding that can store

five-ten items requires 1 second. Musicians could have developed the non-visual coding that non-musicians lacked.

To sum up, the above literature has shown that music experience benefits language reading in that music learning not only makes learners aware of rhyme and rhythm, triggers transfer of learning to the similar symbol system of language, but also helps learners develop larger eye span and faster movement, and strategies of whole-to-part as well as prediction.

Group II—although Group I research supports that idea that relationship between music learning and language reading abilities does exist, there is still other research that suggests no direct relationship between music learning and language reading:

Friedman (1960) investigated how elementary school instrumental classes influence students' reading and arithmetic achievement. A total of three hundred and fifty-four fifth and sixth graders from four elementary schools, matched up for sex, IQ, age, and classroom teacher's teaching style, were divided into the control and experimental groups. Those that scored highest in the Pan American Music Test that measure subjects' ability to discriminate pitch, rhythm, intensity, harmony, and music memory and taste were assigned to the experimental group that devoted 27% of classroom instructional time to instrumental music. No significant difference was found between the experimental and control groups in the pretest, the Stanford Achievement Test, concerning reading and arithmetic achievement, except reading vocabulary in sixth graders, but comparing the arithmetic reasoning, arithmetic computation, paragraph meaning, and word meaning parts of the SAT (the posttest) within schools, tests, or sex, six differences were found in favor of the experimental group and three in favor of the control group. Reading meaning is only significant in fifth grade in favor of the music group ($p<0.05$). Friedman thus concluded that the instrumental groups did not do poorer than the control groups in reading and arithmetic achievement. He also suggested that future research not only be cautious of the Hawthorn effect, meaning that music teachers might plan lessons more carefully, but also examine whether students in instrumental group have higher self-esteem as well as parental support as regard to academic and related activities.

Like Friedman, Kvet (1982) examined whether excusing sixth graders from regular classroom activities for the study of instrumental music affects their reading, language, or math achievement in four public schools differing in school size, location, socioeconomic status, and racial composition. School A is the smallest but wealthiest (N=17); school B and C were middle class (N=42 and 17); school D was the largest but lowest in socioeconomic status (N=45). Participants had joined band or string instrument program that met two times per week, 35-40 minutes per meeting in the fourth or fifth grades. To test their reading, language and math achievement, the Short Form Test of Academic Aptitude (SFTAA) and the California Achievement Test (CAT), Form C were given to participants of schools A and C; the Otis-Lennon School Ability Test, Form R and the Stanford Achievement Test were administered in school B; the Otis-Lennon School Ability Test and the Metropolitan Achievement Test were given to participants enrolled in the school year of 1979-80 while the SFTAA and the CAT were given to those enrolled in the year of 1980-81 at school D. Participants were categorized into two groups: those who had taken instrumental music instruction through sixth grade were labeled as the Instrumentalist group and those who had not taken any instrumental music instruction as the Non-Instrumentalist group. Participants in the instrumentalist and non-instrumental groups were matched up for sex, intelligence, cumulative achievement test score, classroom teacher, socioeconomic status, and behavior. Results of the aptitude and achievement tests demonstrated that there was no significant difference between instrumental and non-instrumental groups ($p>0.05$ in all schools), meaning that participation in the instrumental program during regular class time did not deteriorate children's academic achievement. Kvet suggested that this study should be replicated in other educational settings with different instrumental programs, at other grade levels in private schools in larger cities. Further research should also examine how the amount of time in instrumental study affects academic achievement.

Unlike Friedman and Kvet, Lauder (1976) investigated whether teaching of music as a component of the reading program improves the reading achievement of first-graders in his six-month long study. One hundred and fourteen first-graders from six classes in three schools with one control group and one experimental group in each school participated. Both the control and the experimental groups were instructed by a musical

teacher twice a week, thirty-five minutes per session. The fifty-nine children in the control group received music instruction that targeted at developing in students positive attitude toward music and providing experiences and activities associated with basic music skills and knowledge. In addition to what the control group received, the fifty-six children in the experimental group also received 1) music exercises correlated with the Houghton Mifflin Readers that were used in their reading program 2) activities relating music to the reading program 3) activities taken from the Silver Burdett Music program, and 4) general interest activities. All the activities were to help students in the experimental group to master reading skills via rhythm, rhyme/melody, singing, chanting, movement, musical drama and notation, instruments, and visual materials. Both the control and experimental groups took the Comprehensive Tests of Basic Skills, Level A, Form S in the pretest and the Comprehensive Tests of Basic skills, Level B, form S in the posttest. The eight subtests in the pretest included letter forms, letter names, listening for information, letter sounds, visual discrimination, sound matching, language, and math while those in the posttest encompassed letter sounds, word recognition I and II, reading comprehension, language I and II, math concepts and application, as well as math computation. Results of the pretest and posttest showed that none of the subtest, except letter sound (identifying initial consonants and vowels of words read aloud)in the pretest and letter sound (identifying letters that make a particular sound in words read aloud, including middle vowels, beginning consonant digraphs or blends, and final consonants) in the posttest, reached the 0.05 level of significance. Therefore, Lauder came to the conclusion that teaching music in the reading program did not improve student's reading achievement.

On the other hand, Harding's (1990) study in which third graders with high and low amount of musical experience participated examined the relationship between musical experience in early childhood and language skill development. The two groups were compared for language skill development that was measured by using the Comprehensive Tests of Basic Skills that encompasses expressive scores and mechanical (reading and spelling) scores. Also, the gender factor was examined in this study (that is, to see if boys and girls were provided with different levels of musical experience in early childhood as well as if boys and girls have different levels of achievement in language

skills). Results suggested (1) There was no interaction between gender and musical experience on language achievement. (2) There was no difference between boys and girls concerning language skill achievement, but girls did show a higher mean than boys in mechanical language skills. (3) Girls had more musical experience during early childhood than boys and girls scored higher than boys in all areas tested. (4) In the three language skills tested, musical experience is positively correlated with language skill development. However, mechanical language was the only area where a significant relationship was not found. Harding thus concluded that a strong relationship exists between early music experience and language skill development. Owing to the fact that this study was not an experimental study, a casual relationship cannot be inferred. Nevertheless, it is recommended by Harding that children be provided with musical experience in early childhood to facilitate their language development.

To investigate the influence of instrumental music instruction on academic achievement, two hundred and seventy fifth-graders from an elementary school participated in Dryden's (1992) study. Of all the participants, one hundred and sixty-four joined band or orchestra. Such variables as gender, race, socioeconomic status, family structure (single vs. two parents), mother's level of formal education, and length of enrollment in school were also taken into account. The Comprehensive Tests of Basic Skills, fourth edition, level 15, were use to measure academic achievement. Results showed that participants in band outperformed those in orchestra or the control group in the reading vocabulary part. Comparing those variables against each other within the instrumental music instruction group, Dryden found that (1) Boys performed better in reading vocabulary than girls. (2) Participants who received free/reduced price lunch scored lower than those who did not ($p=0.0457$). (3) No relationship was found between family structure and academic achievement ($p>0.05$). (4) There was no relationship between length of enrollment at school and academic achievement. As a result, Dryden came to the conclusion that instrumental music instruction did not negatively affect academic achievement.

One of the drawbacks of this study lies in that Dryden did not examine what differed between band and orchestra training, which in turn caused the gap in language reading ability.

Similar to Dryden's report, Robitaille and O'Neal's (1981) article also summarized a study investigating the relationship between achievement and participation in band/orchestra in seventy-five elementary schools. Of the 5154 fifth graders taking the Comprehensive Tests of Basic Skills (CTBS) that is comprised of reading and language sections in 1979, 910 and 357 were enrolled in band and orchestra, respectively. In 1980, 893 and 312 out of the 5299 fifth graders taking the CTBS participated in band and orchestra. In all areas of comparison, students enrolled in instrumental program outscored the total fifth graders in the CTBS. Robitaille and O'Neal were cautious, suggesting that perhaps better students selected musical programs. However, it was also shown that the longer one stayed in the instrumental program, the better s/he scored on the CTBS in comparison with other fifth graders.

As a follow-up test, Robitaille and O'Neal randomly selected one hundred and twenty-nine musical students in 1980 and paired them with nonmusical students from the same school and with matched scores on the Short-Form Test of Academic Aptitude. Scores of the CTBS of musical and nonmusical students were then compared. Results demonstrated that musical students had an average raw score one point higher than nonmusical students, but the difference was insignificant. Their conclusion is that students enrolled in band or orchestra program suffered no loss of skills, but for some unknown reasons, music students performed better than nonmusical students on academic aptitude.

In addition to Robitaille and O'Neal's study, Babbitt (1976) also investigated whether classes taught by music specialists improve students' reading ability more than those taught by classroom teachers. Two hundred and ninety-six second-graders from schools of various socioeconomic levels participated with the experimental group taught by music specialists while the control group by non-music classroom teachers. The experimental and control groups were also paired according to socioeconomic status and reading program that was either the Grinn 360 Reading Program or the Holt Basic Reading System. Students took the Metropolitan Achievement Test, Primary II, forms F, and G in pretest and posttest, respectively. Data collection was via questionnaires and observations via which researcher found that the control groups received more time for music, possibly because not only did those teachers show more than casual interest in

music but also the Hawthorn effect was involved. All the music teachers emphasized the concepts of rhythm, melody, and meter with the music specialist using more varied activities to teach these concepts. Results indicated that significant difference was fond in only one case—low socioeconomic class having music taught by a music specialist improved reading ability as compared to low socioeconomic class having music taught by a classroom teacher ($p<0.01$). Also, socioeconomic status and reading program did not have significant effects on the reading achievement of students taught by music specialists as compared to those taught by classroom teachers. Babbitt suspected that it is because classroom teachers supplied their students with more music instruction than music specialists that no significant difference was found between the two groups. Babbitt recommended that this study be replicated with predetermined time allocation for music and reading instruction.

Olanoff and Kirschner (1969) were interested in the nature and extent of academic and motivational change in junior high school students with low academic achievement, low socioeconomic status, but talented in music. Five hundred freshmen from junior high schools participated in their three-year long study. Participants were the top 40% of musically talented students of 1200 students that took a music aptitude test. The experimental group received music instruction (vocal, string or wind) while the control group received non-music program. After three years of music program, both the experimental and control groups were asked to take academic achievement tests—the Metropolitan Achievement Test in Reading (word knowledge, and reading comprehension) was used to measure reading ability and the Iowa Every Pupil Basic Arithmetic Skills was administered to measure math. The Iowa Every Pupil Test of Language was used to measure English while the Iowa Language Abilities Test was given to measure language usage. Findings are—Concerning language reading (1) Word knowledge: No significant difference was found between the seventy-nine students in the experimental group and eighty-three in the control group. (2) Reading comprehension: No difference existed in three of the four schools being compared. For one school, the experimental group outperformed the control group ($p<0.05$). (3) Total Metropolitan Achievement Test: No significant difference was found either in total groups or comparisons among schools.

This author believes that knowing what the experimental group did in their training activities would help understand why instrumental training facilitated language reading.

Wolff (1980) examined the relationship between music experience and language reading in first-graders. Forty-five male first-graders with normal intelligence and from low to low-middle socioeconomic status participated in this study that explored to what extent children receiving music instruction differed from those not receiving instruction. The Metropolitan Readiness Test was administered to all subjects to ensure the experimental and the control groups were similar with respect to readiness in reading and math. The experimental group received thirty-minute music instruction daily for five months while the control group did some other activities in the classroom when the experimental group was having musical instruction. Four tests were conducted following the same order for the pre- and post-tests: 1)The Metropolitan Achievement Tests, Form F of Primary I level was used to measure students' reading and math achievement. 2) The Simons Measurements of Music Listening Skills that tested music listening skills was administered to test students' musical abilities. 3) Form B of The Torrance Tests of Creative Thinking tested originality, elaboration, fluency, and flexibility of students' creative thinking. 4) The Purdue Perceptual-Motor Survey tested perceptual and motor skills. In addition to all these tests, students' records of school absenteeism, that is, numbers of days absent, were also noted.

Results were 1) Music instruction did not benefit reading scores or school attendance. 2) The experimental group outscored the control group on all subtests of the Torrance Tests of Creative Thinking. 3) The experimental group scored much higher in the posttest of The Purdue Perceptual-Motor Survey than in the pretest. 4) The experimental group's gain on music listening test was more than 4.5 times greater than that of the control group. 5) Effects of experimental treatment were more pronounced for children with higher achievement and of male gender. Therefore, Wolff concluded that music instruction did not positively affect reading achievement. However, this study does have one drawback which is all the participants were male, thus generalizability of conclusion of this study to female population is not possible.

In a nutshell, the above research has indicated that music learning appears to have nothing to do with language reading, albeit that music learning does not negatively nor positively influence language reading.

Group III—Still other research found that language reading is more related to other factors, such as socioeconomic status, social capital, intelligence, etc., than to music learning—

1)Socioeconomic status:

In order to examine the relationships among socioeconomic status, music training, academic achievement, and music audiation (hearing music internally through recall), children between the age of six and eight participated in this study conducted by Barrett (1993). Group one (N=14) and two (N=66) both consisted of children from high socioeconomic families, but only group one received Suzuki violin training. Group three (N=13) and four (N=45) encompassed children from low socioeconomic families, but only group 3 received Suzuki violin training. Before all participants took the Primary Measures of Music Audiation (PMMA), they were given standardized academic achievement tests—group 1 took the California Achievement Test (CAT), except one took the Iowa Test of Basic Skills (ITBS), one took the Comprehensive Test of Basic Skills (CTBS) and another took the Stanford Achievement Test (SAT). Group 2 took the California Achievement Test, group 3 took the Comprehensive Test of Basic Skills. Spanish-speaking children in group 4 were given the Spanish version of the CTBS while English-speaking children were given the CAT. Comparing the PMMA with socioeconomic status and music training, researcher found that the latter two both had significant effect on the PMMA ($p=0.0001$ and $p=0.0005$, respectively). As for the relationship between the PMMA and academic achievement, correlation was discovered between language and melody for group 1 ($r=0.52$, $p<0.05$), between math and rhythm for group 2 ($r=0.40$, $p<0.05$), and for those in group 4 taking CTBS ($r=0.66$, $p<0.05$). For all those taking CAT, a correlation between math and PMMA rhythm was discovered ($r=0.35$, $p<0.05$) as well as between language and PMMA melody ($r=0.41$, $p<0.05$). Finally, there was a correlation between the PMMA total and the CAT total ($r=0.48$, $p<0.01$). Barrett thus concluded that (1) Not only musical training but also socioeconomic status influenced PMMA scores, which seemed to indicate that

advantaged children enjoyed more material advantages than disadvantaged one. (2) PMMA failed to predict the proficiency level of those children receiving Suzuki training, but seemed to be a better predictor of socioeconomic status and academic achievement. In other words, socioeconomic status has profound effect on both academic and musical test results of these children.

2)Social capital:

Morrison (1994) studied the relationship between music learning and academic growth via data gathered from responses of 18221 high school sophomores 22.3% of whom participated in school music activities, such as band, orchestra, or choir. And of those music participants 63.2% were female and 36.8% were male. 76.1% were white, 9.2% were African-American, 7.7% were Hispanic and 6.1% were Asians. Regarding socioeconomic status and music participation, Morrison found that students from low status were underrepresented while those from high status were overrepresented, which Morrison believed might result from the fact that band and orchestra required monetary investment which students from low socioeconomic families might not be able to afford. Besides, those from low socioeconomic families might have to work after school to supply family income, so chances are they could not participate in music activities outside the normal school schedule. As far as academic achievement is concerned, Morrison found that more music participants had been honored by school or community than music non-participants for their class leadership or academic scholarship. Moreover, when participants were asked to report their academic performance in English, history, science, and math from ninth grade up to the time of the study, the percentage of music students getting A's, A's and B's, or B's outnumbered that of non-music students. The percentage difference was 10.9% in English, 8.9% in history, 8.5% in science, and 6.1% in math. Morrison thus recommended that further research investigate whether music participation reinforces motivation, self-discipline, and self-esteem, which in turn facilitates success in broad arena of academic ad social endeavors.

3)Intelligence:

Wheeler and Wheeler (1952) studied two hundred and forty-three fifth and sixth graders who participated in their study that investigated the relationship between music and language reading abilities. All students had music instruction emphasizing music

appreciation and activities at school. Division two, Form A of the Knuth Achievement Test in Music (KATM) that measures achievement in recognition of rhythm and melody from its notation was administered to test participants' music reading ability while Form A of the Progressive Reading Tests (PRT) that measure vocabulary and comprehension skill was conducted to examine their language reading ability. Results of these two tests and their sub-tests were compared against each other and participants' IQ as well as years of private music study (ranging from three weeks to five years). Findings included (1) Those receiving private music lessons scored higher on KATM than those receiving no private music lessons (critical ratio=2.59). (2) Language reading appeared to be more related to intelligence (r=0.57) than music reading (r=0.30). Consequently, Wheeler and Wheeler suggested that future research with large numbers of cases and varied techniques of study should be done.

The author speculates that since this study was not prolonged and years of private music study of subjects were not very long (only three weeks to five years), the effect of music may not be strong enough to influence their test results.

4)Other:

Gruff (1977) questioned the belief that music and language reading were related. Some people suggested that music created a positive attitude in the child and this attitude could be transferred to language reading, which according to Gruff, had no research support. He also suspected that music taught by disinterested teachers might be even less successful than ordinary methods. The notion that poor oral reading is the cause of poor reading skills was also questioned by Gruff who believed oral reading was only one representation of silent reading skills. Thus, the notion that training children via music to improve pitch and tone of their voices while reading orally would assist silent reading skills seemed misleading, Gruff claimed.

In response to the declaration that music helped learners develop auditory and visual perceptions which were also essential in language reading, Gruff reported a study which suggested that good language readers had longer eye-voice span than the poor ones whereas good music readers did not have longer eye-hand span than unsuccessful ones. Also, while successful language readers had fewer re-reading fixations than unsuccessful ones, successful music readers had more re-reading fixations than unsuccessful ones.

Gruff also pointed out that research done by Van Nuys and Weaver (1943) found that eye-fixations were longer in music than in language reading. To refute the idea that correct dictation in singing assisted a learner to acquire the ability to read words, Gruff claimed that this look-say, whole-word method was similar yet inferior to phonics method. Also, this look-say method ignored what the research found that children used letters as cues for word recognition instead of by sight. To question the idea that music and word reading both involve "language", Gruff postulated that music was more in the affective realm while language in the cognitive realm.

Gruff also argues that the relationship between music and language reading was too low to warrant a correlation. Besides, if there was a relationship, then musical students should be the best language learners. However, liberal arts college students were found by Wheeler and Wheeler (1951 cited in Gruff, 1977) to be better language learners than musical students. Studies conducted by Hutton (1953 cited in Gruff, 1977), and Pelletier (1963 cited in Gruff, 1977), also suggested that no significant difference existed between language reading scores of children receiving music training and those receiving no music training. Though Seides' (1967 cited in Gruff, 1977) study did demonstrate that intellectually retarded but musically talented students, when put into a class that emphasized visual-motor activities, arts, and music, scored higher in language reading than those in regular class, Gruff still doubted how much of these students' growth in reading was due to their daily music lesson alone. Other research that showed children receiving music activities achieved higher in reading than those receiving no music activities was also criticized by Gruff as biased on the grounds that equal conditions in the experimental and control groups were not matched.

To sum up, research in group III has shown that such factors as socioeconomic status, social capital, or intelligence might be involved in music learning and language reading.

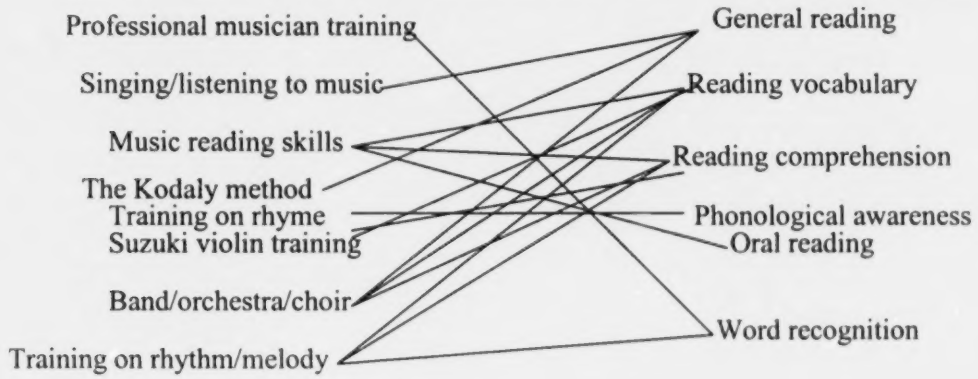
Discussion & Conclusion

It seems that the relationship between music and language reading remains undecided, given the research reported is remarkably inconsistent—Group I suggested there is a positive relationship between music and language reading, group II suggested no positive relationship and still group III suggested no relationship at all. Research

indicating that there is a positive relationship between music and language reading suggested that 1) the power of prediction, 2) whole-to-part strategy, 3) awareness of rhythm, 4) rhyme and phonological awareness, 5) transfer of learning to similar symbol systems, and 6) enlarged eye span and faster movement, all of which gained from music learning, could be applied to language reading. Research indicating that other variables are involved suggested that 1) socioeconomic status, 2) social capital or 3) intelligence might be better predictors of language reading achievement than music experiences. But generally speaking, conclusions from the literature reviewed suggest that listening to songs or singing does not facilitate language silent reading and that spending class time on music instruction would not negatively affect students' academic performance, including language reading.

Even though inconsistency exists among the literature reviewed in this paper, it may be because different research investigated different aspects of music experience, ranging from listening to songs, singing, training on music reading skills, rhythm, or rhyme to Kodaly method, Suzuki violin training or participation in band, orchestra, and choir. Similarly, different experiments assessed different aspects of language reading, ranging from general reading ability, reading vocabulary, reading comprehension to word recognition, phonological awareness or oral reading. Consequently, although one type of music experience may not benefit certain aspects of language reading, it does not mean that it will not have impact on other aspects of language reading. For instance, training that focused on rhythm and melody was shown to have no impact on reading vocabulary and comprehension in Wheeler and Weeler's (1952) study, but it did correlate with word recognition and spelling in Douglas and Willatts' (1994) research. Singing might not improve silent reading, but this researcher speculates it might give an impetus to oral reading. In a word, more research is needed to see the degree to which the results from research reviewed here are valid, reliable, and generalizable. Additionally, further research needs to investigate the relationships between other aspects of music training and language reading (see figure 1 below).

Figure 1: Existing studies between aspects of music and aspects of reading



(Solid lines indicate one or more studies have been done to examine a particular relationship)

- Listening to music vs. reading general: Harding (1990)
- Music reading skills vs. reading vocabulary and comprehension: Movsesian (1967)
- The Kodaly method vs. reading general: Hurwitz (1975)
- Suzuki violin training vs. reading vocabulary and comprehension: Barrett (1993)
- Band/orchestra vs. reading vocabulary and comprehension: Kvet (1983), Dryden (1992), Olanoff & Kirschner (1969)
- Rhythm vs. reading general: Douglas & Willatts (1994)
- Instrument playing vs. word meaning and paragraph meaning: Friedman (1960)
- Recognition of rhythm and melody from notation vs. reading vocabulary and comprehension: Wheeler & Wheeler (1952)
- Awareness of rhyme vs. phonological awareness: Bradley & Bryant (1983), McClean (1987)

This author also speculates that music training thirty minutes per day, two days a week for six months would have less influence on learners than sixty minutes per day, five days a week for six years. Since most of the studies reviewed here did not last for a long time, it is very possible that with longer musical training more positive and statistically significant relationships might be revealed. In other words, it is this author's speculation

that some of the effects derived from music training might be easier to detect in the long run rather than immediately.

In addition, due to the fact that most research reviewed in this report was limited to primary school children with merely a few reports on preschool children, junior and senior high school students, and postsecondary adults, generalizability of the conclusion for the primary school children might still be high but that for the other age groups is highly doubtful. In other words, we are pretty sure that primary school students might benefit from music learning in that it helps them to become more aware of rhyme and rhythm, and accelerates the transfer of learning to language learning, a similar symbol system. How music learning is related to language reading for preschool children, junior or senior high school or postsecondary learners, however, still needs more investigation, given the little research done with those age groups.

Recommendation

For teachers and educators:

It is recommended that teachers and educators integrate music instruction in language classroom on the grounds that music could facilitate language learning. Even if music instruction does not facilitate language learning, it at least would not hamper language learning—Sloboda's (1974, 1976, and 1985) reports of university students, and adults proved that prediction by means of making inferences was found in both music and language sight reading. Hence, training on music reading may develop the skills of predicting that are required in successful language reading. Hahn's (1987) study particularly specified that it was the training on recognition of melody contour and rhythm patterns that enhanced this power of prediction in elementary school children. Therefore, for teachers and education practitioners who intend to hone learners' skill of making prediction in language reading, this author would recommend music instruction targeting at melody and rhythm.

Movsesian's (1967) research, on the other hand, demonstrated that training on music reading skills improved language reading vocabulary and comprehension of elementary school students, but not oral reading. Hence, this author recommends that teachers interested in assisting beginning learners with silent language reading try to incorporate music reading instruction in the classroom. Both Hurwitz's study (1974), and

Douglas and Willatts' study of elementary school students (1994) also indicated that music training targeting at developing children's auditory, visual, and motor skills benefited language reading. Furthermore, music instruction designed to assist reading programs was shown to improve reading abilities of slow elementary school learners (Nicholson, 1972) instead of normal ones (Lauder, 1976), which led this author to suggest that music instruction designed to assist reading programs be provided to slow elementary school students.

For parents:

None of the literature reviewed here demonstrated that music training negatively influenced language reading: research in group II showed that music instruction would not hinder language learning and research in group III also suggested that learners enjoying more material and social resources performed better in language reading. Thus, this author recommends that parents provide learners as many resources as possible and encourage them to participate in bands, orchestras, or choirs at school.

For researchers:

Further research needs to define music reading and language reading first in order to see what kind of music training is most beneficial (e.g. musicology, vocal, instrument playing, etc.) to language reading (e.g. first language, second language, foreign language, etc.). Within the category of instrument playing, researchers also need to investigate the difference between oriental music and western music, as well as different effects of instrument playing from wind instruments (e.g. trumpet, flute, etc.), to string instruments (e.g. guitar, cello, violin, harp, etc.) to group instrument playing (e.g. band, orchestra, etc.). In the same way, languages other than English, such as other Roman languages (e.g. German, Spanish, Italian, etc.) or non-Roman languages (e.g. Russian, Arabic, Thai, Chinese, Korean, etc.) needs to be further explored because it is this author's speculation that the learning of western music that use the same alphabetic system as Roman languages might be more beneficial to Roman languages than non-Roman languages. Even more importantly, researchers should examine what aspects of music reading (e.g. rhythmic training, musical notation, training of rhyme, etc.) have most impacts on language reading (e.g. word recognition, phonological awareness, reading comprehension, etc.). Researchers can start from the investigation of the influence of

reading musical notation in piano instruction of western music on the acquisition of word recognition in English as a foreign language or the impact of oriental musicology on the acquisition of alphabets of Chinese as a first language.

In addition, further research should try to control possible interfering variables, such as age, socioeconomic status, intelligence, social capital, or level of proficiency in music and level of proficiency in language, when investigating the relationship between music and language reading. Examination of other age groups, including preschool children, junior and senior high school students as well as postsecondary adults, is absolutely necessary. Researchers also need to be cautious that proficiency level might be one factor influencing the effect of transfer. Consequently, further studies should investigate the interconnection between rudimentary, intermediate, and advance music reading proficiency with rudimentary, intermediate, and advance language reading.

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Note: The author can contacted via yechang@indiana.edu or Carrie Chang, W. W. Wright Education Building, 201 North Rose Avenue, Department of Language Education, Indiana University, Bloomington, IN 47405-1006.

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